

in the sub-family *Bisiphonia* which has two rings of anthers in the column. Root tips of *H. brasiliensis* and growing points of the other species were fixed in Flemming's strong solution. Buds of *H. brasiliensis* were fixed in a solution of two parts alcohol and one part acetic acid and were imbedded in paraffin. Smears were not satisfactory with such small anthers. The material was all stained with gentian violet by Newton's method.

The four species of *Hevea* studied had the same number of chromosomes—34—as the diploid count. This count was verified in the case of *Hevea brasiliensis* by counts made of chromosomes in the pollen mother cells. In these there were 17 chromosomes. Division was quite regular in every case observed, both in the homotypic and the heterotypic division.

The matter of whether or not hybridization takes place among the various species of *Hevea* has led to much discussion. T. F. C. (3) has stated that: "Experience has shown that cross-fertilization between *H. confusa* and *H. brasiliensis* readily takes place."

While the chromosome count adds no positive information as to whether hybridity has or has not taken place, the fact that all species investigated contain the same haploid number would suggest that fertile hybrids might be formed in some cases. It is evident that the haploid chromosome complement is quite stable.

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SUMMARY

A study of the chromosomes of *Hevea brasiliensis* Muell. Arg., *H. collina* Huber, *H. guianensis* Aubl., and *H. Spruceana* (Benth.) Muell. Arg. has revealed a diploid count of 34 in every case, and a haploid number of 17 in *H. brasiliensis*.

While no direct evidence of hybridity between species is offered, the possibility of fertile hybrids is indicated.

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LITERATURE CITED

- HEUSSER, C. (1919). Over de voortplantings organen van *Hevea brasiliensis* Muell. Arg. (Archief voor de Rubbercultuur in Nederlandsch Indie).
HUBER, S. (1913). Novas contribuicoes para o conhecimento do genero *Hevea*. (Bol. Mus. Goeldi).
T. F. C. (1920). Notes on *Hevea Confusa* Hemsl. (Gard. Bull. Straits Settl. 2: no. 6, p. 205.

THREE SPECIES OF BOTRYODIPLODIA (SACC.)
ON ELM TREES IN THE UNITED STATES

CHRISTINE BUISMAN

Plates 38 and 39 and text figure

IN CONNECTION with my work on the *Graphium* disease of elm trees in Europe, I studied some die-back diseases of Elms in the United States. Part of these investigations are related to three species of the genus *Botryodiplodia*. Two of these species were described as species of the genus *Sphaeropsis*, but were transferred by Petrak and Sydow to the genus *Botryodiplodia*. Since they are known in literature as *Sphaeropsis* species, however, I shall frequently use that name in the course of this paper, though I agree with Petrak and Sydow that their proper place is in the genus *Botryodiplodia*.

In 1920 Hubert and Humphrey described a serious die-back of American White Elm in Wisconsin. As a result of cankers extending from the twigs into the branches or into the stem, a large part of the tree or even the whole tree died. As Hubert and Humphrey always found *Sphaeropsis ulmicola* Ell. et Ev. on the cankers and always isolated this fungus from the wood of the diseased areas, they consider it the cause of the disease. Their publication, however, is only a preliminary account of the trouble, and inoculation experiments have not been made by them. They suppose that *Sphaeropsis ulmicola* Ell. et Ev. might be identical with *Sphaeropsis malorum* Peck, the well-known cause of blackrot of apples and of an apple tree canker. They pointed out the morphological similarity between the Elm *Sphaeropsis* and the Apple *Sphaeropsis*. Apples were attacked readily when inoculated with the Elm *Sphaeropsis*. Since the disease seems to have decreased, however, in the years following 1920, no further investigations have been carried out on the identity and the pathogenicity of *Sphaeropsis ulmicola* from a phytopathological point of view.

After I came to New England in the fall of 1929, I collected various diseased elm twigs on which a *Sphaeropsis* species was present. I decided, therefore, to continue the work of Hubert and Humphrey. During these investigations I came to the conclusion that three different species of *Sphaeropsis* may be found on elm twigs.

I. Hesler mentions the occurrence of *Sphaeropsis malorum* Peck (*Botryodiplodia malorum* [Peck] Petrak et Sydow) on twigs of *Ulmus americana*. As stated by Petrak and Sydow, the synonymy of this fungus is very complicated and not yet quite clear. It has